

DATA SHEET

Class 2, X7R 16 V, 25 V and 50 V Surface mount ceramic multilayer capacitors

Product specification
Supersedes data of 6th December 1999
File under Discrete Ceramics, ACM2

2000 May 24

Surface mount ceramic
multilayer capacitors

Class 2, X7R 16 V, 25 V and 50 V

FEATURES

- Six standard sizes
- High capacitance per unit volume
- Supplied in tape on reel or in bulk case
- NiSn terminations.

APPLICATIONS

- Consumer electronics, for example:
 - Tuners
 - Television receivers
 - Video recorders
 - All types of cameras
- Telecommunications
- Automotive
- Data processing.

DESCRIPTION

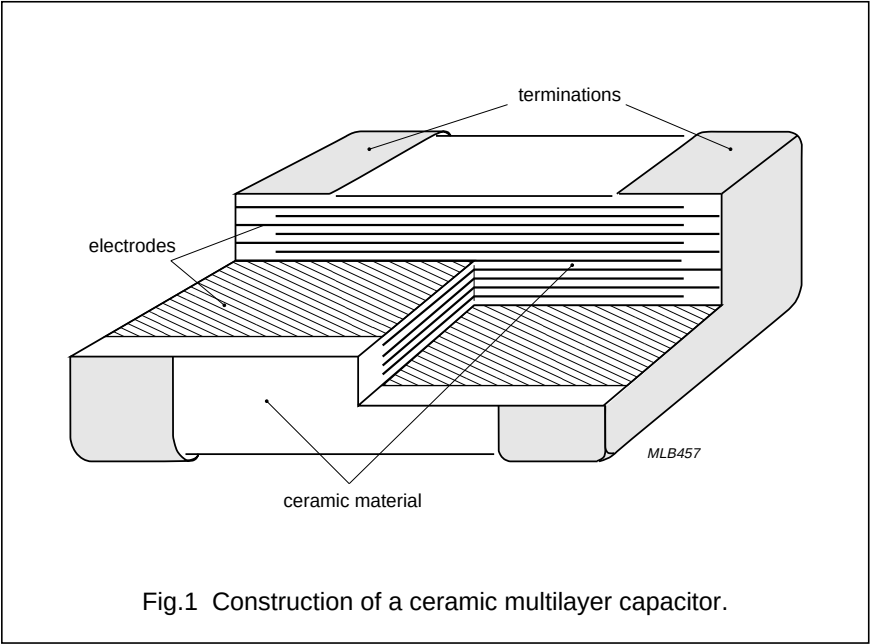
The capacitor consists of a rectangular block of ceramic dielectric in which a number of interleaved nickel electrodes are contained. This structure gives rise to a high capacitance per unit volume.

The inner electrodes are connected to the two terminations by a copper-dipped layer and finally covered with a layer of plated nickel/tin (NiSn).

A cross section of the structure is shown in Fig.1.

QUICK REFERENCE DATA

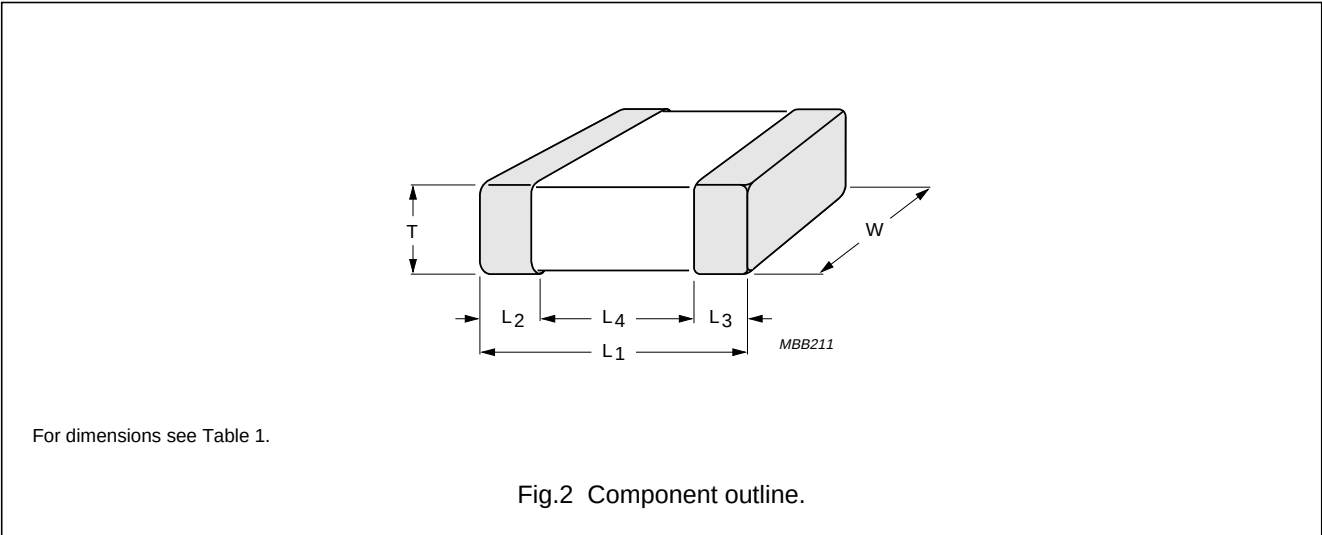
DESCRIPTION	VALUE
Rated voltage U_R (DC)	16 V, 25 V and 50 V (IEC)
Capacitance range (E12 series): 16 V 25 V 50 V	22 nF to 1 μ F 10 nF to 470 nF 100 pF to 1 μ F
Tolerance on capacitance	$\pm 10\%$; $\pm 5\%$
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Sectional specifications	IEC 60384-10, second edition 1989-04; also based on CECC 32 100
Detailed specification	based on CECC 32 101-801
Climatic category (IEC 60068)	55/125/56



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MECHANICAL DATA



Physical dimensions

Table 1 Capacitor dimensions

CASE SIZE	L ₁	W	T		L ₂ and L ₃		L ₄ MIN.
			MIN.	MAX.	MIN.	MAX.	
Dimensions in millimetres							
0603	1.6 ±0.10	0.8 ±0.07	0.73	0.87	0.25	0.65	0.40
0805	2.0 ±0.10	1.25 ±0.10	0.50	1.35	0.25	0.75	0.55
1206	3.2 ±0.15	1.6 ±0.15	0.50	1.75	0.25	0.75	1.40
1210	3.2 ±0.20	2.5 ±0.20	0.50	1.80	0.25	0.75	1.40
1812	4.5 ±0.20	3.2 ±0.20	0.50	1.80	0.25	0.75	2.20
2220	5.7 ±0.20	5.0 ±0.20	0.50	1.80	0.25	0.75	2.90
Dimensions in inches							
0603	0.063 ±0.004	0.032 ±0.003	0.029	0.035	0.010	0.026	0.016
0805	0.079 ±0.004	0.049 ±0.004	0.020	0.053	0.010	0.030	0.022
1206	0.126 ±0.006	0.063 ±0.006	0.020	0.069	0.010	0.030	0.056
1210	0.126 ±0.008	0.098 ±0.008	0.020	0.072	0.010	0.030	0.056
1812	0.177 ±0.008	0.126 ±0.008	0.020	0.072	0.010	0.030	0.088
2220	0.224 ±0.008	0.197 ±0.008	0.020	0.072	0.010	0.030	0.114

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SELECTION CHART FOR 16 V AND 25 V

C (pF)	LAST TWO DIGITS OF 12NC	16 V			25 V			
		0603	0805	1206	0603	0805	1206	1210
10000	36							
12000	37							
15000	38				0.8 ±0.07			
18000	39					0.6 ±0.1		
22000	41							
27000	42							
33000	43							
39000	44							
47000	45	0.8 ±0.07						
56000	46		0.6 ±0.1			0.85 ±0.1		
68000	47							
82000	48							
100000	49							
120000	51							
150000	52		0.85 ±0.1				0.85 ±0.1	
180000	53							
220000	54							
270000	55			0.85 ±0.1			1.15 ±0.1	0.5 to 1.0
330000	56							
390000	57		1.25 ±0.1					
470000	58							0.9 to 1.3
560000	59							
680000	61			1.15 ±0.1	Values in shaded cells indicate thickness classification.			
820000	62							
1000000	63							

Thickness classification and packaging quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH AMOUNT PER REEL				AMOUNT PER BULK CASE		
	Ø180 mm; 7"		Ø330 mm; 13"				
	PAPER	BLISTER	PAPER	BLISTER	0603	0805	1206
0.6 ±0.1	4000	4000	20000	10000	–	10000	–
0.85 ±0.1	4000	4000	15000	10000	–	8000	3000
0.5 to 1.0	–	4000	–	10000	–	–	–
0.8 ±0.07	4000	4000	15000	15000	15000	–	–
0.9 to 1.3	–	3000	–	10000	–	–	–
1.15 ±0.1	–	3000	–	10000	–	–	2000
1.25 ±0.1	–	3000	–	10000	–	5000	–

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Class 2, X7R 16 V, 25 V and 50 V

ORDERING INFORMATION

Components may be ordered by using either a simple 15-digit clear text code or Philips unique 12NC.

Clear text code

Example: 08052R104K7BB0D

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKAGING	MARKING	SERIES
0603 0805 1206 1210	2R = X7R	104 = 100 000 pF; the third digit signifies the multiplying factor: 3 = × 1 000 4 = × 10 000 5 = × 100 000	J = ±5% K = ±10%	7 = 16 V 8 = 25 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper B = 180 mm; 7" blister F = 330 mm; 13" blister P = bulk case	0 = no marking 2 = 2-character marking in North America only	D = BME

Ordering code 12NC

2 2 X X X X X X 5 X X X

Carrier type

22 blister
38 paper tape
54 bulk

Rated voltage - Termination

78 16 V; NiSn
91 25 V; NiSn

Size

6 0603
0 0805
1 1206
2 1210

Capacitance value⁽¹⁾

Tolerance

5 ±5%
6 ±10%

Packaging⁽²⁾

1 reel: Ø180 mm; 7"
5 reel: Ø330 mm; 13"
4 bulk case

CCB651

(1) Refer to chapter "Selection chart for 16 V and 25 V".

(2) Amount on reel depends on thickness classification, see section "Thickness classification and packaging quantities".

Surface mount ceramic multilayer capacitors

Class 2, X7R 16 V, 25 V and 50 V

SELECTION CHART FOR 50 V

C (pF)	LAST TWO DIGITS OF 12NC	50 V					
		0603	0805	1206	1210	1812	2220
100	09						
120	11						
150	12						
180	13						
220	14						
270	15						
330	16						
390	17						
470	18						
560	19						
680	21						
820	22						
1000	23						
1200	24						
1500	25	0.8 ±0.07					
1800	26		0.6 ±0.1				
2200	27						
2700	28						
3300	29						
3900	31			0.85 ±0.1			
4700	32						
5600	33						
6800	34						
8200	35						
10000	36						
12000	37						
15000	38						
18000	39						
22000	41						
27000	42						
33000	43						
39000	44		0.85 ±0.1		0.5 to 1.0		
47000	45						
56000	46						
68000	47						
82000	48		1.25 ±0.1				
100000	49						
120000	51						
150000	52						
180000	53			1.15 ±0.1	0.9 to 1.3		
220000	54					0.5 to 1.0	
270000	55						
330000	56	Values in shaded cells indicate thickness classification.					
390000	57						0.5 to 1.0
470000	58					0.9 to 1.3	
560000	59						
680000	61						
820000	62						
1000000	63						0.9 to 1.3

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Thickness classification and packaging quantities

THICKNESS CLASSIFICATION (mm)	8 mm TAPE WIDTH AMOUNT PER REEL				12 mm TAPE WIDTH AMOUNT PER REEL		AMOUNT PER BULK CASE			
	Ø180 mm; 7"		Ø330 mm; 13"		Ø180 mm; 7" BLISTER					
	PAPER	BLISTER	PAPER	BLISTER	1812	2220	0402	0603	0805	1206
0.6 ±0.1	4000	4000	20000	10000	–	–	–	–	10000	–
0.85 ±0.1	4000	4000	15000	10000	–	–	–	–	8000	3000
0.5 to 1.0	–	4000	–	10000	2000	1500	–	–	–	–
0.8 ±0.07	4000	4000	15000	15000	–	–	–	15000	–	–
0.9 to 1.3	–	3000	–	10000	1500	1500	–	–	–	–
1.15 ±0.1	–	3000	–	10000	–	–	–	–	–	2000
1.25 ±0.1	–	3000	–	10000	–	–	–	–	5000	–

ORDERING INFORMATION

Components may be ordered by using either a simple 15-digit clear text code or Philips unique 12NC.

Clear text code

Example: 08052R104K9B20D

SIZE CODE	TEMP. CHAR.	CAPACITANCE	TOL.	VOLTAGE	TERMINATION	PACKAGING	MARKING	SERIES
0603 0805 1206 1210 1812 2220	2R = X7R	104 = 100 000 pF; the third digit signifies the multiplying factor: 1 = × 10 2 = × 100 3 = × 1 000 4 = × 10 000 5 = × 100 000	J = ±5% K = ±10%	9 = 50 V	B = NiSn	2 = 180 mm; 7" paper 3 = 330 mm; 13" paper B = 180 mm; 7" blister F = 330 mm; 13" blister P = bulk case	0 = no marking 2 = 2-character marking in North America only	D = BME

Ordering code 12NC

2 2 X X X X X X 5 X X X

Carrier type

22 blister
38 paper tape
54 bulk

Rated voltage - Termination

58 50 V; NiSn

Size

6 0603
0 0805
1 1206
2 1210
4 1812
5 2220

Capacitance value⁽¹⁾

Tolerance

5 ±5%
6 ±10%

Packaging⁽²⁾

1 reel: Ø180 mm; 7"
5 reel: Ø330 mm; 13"
4 bulk case

CCB652

(1) Refer to chapter "Selection chart for 50 V".

(2) Amount on reel depends on thickness classification, see section "Thickness classification and packaging quantities".

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ELECTRICAL CHARACTERISTICS

Class 2 capacitors; X7R dielectric; NiSn terminations

Unless otherwise stated all electrical values apply at an ambient temperature of 20 ± 1 °C, an atmospheric pressure of 86 to 106 kPa, and a relative humidity of 63 to 67%.

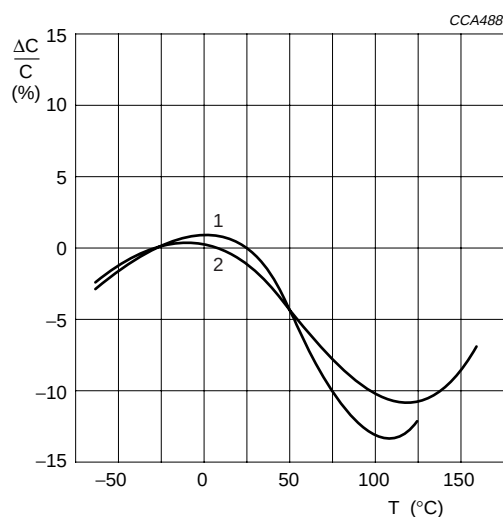
DESCRIPTION	VALUE
Capacitance range (E12 series); note 1	100 pF to 1 μ F
Tolerance on capacitance after 1000 hours	$\pm 10\%$; $\pm 5\%$
Tan δ ; note 1 16 V 25 V and 50 V	$\leq 3.5\%$ $\leq 2.5\%$
Insulation resistance after 1 minute at U_R (DC)	$R_{ins} \times C > 500$ seconds
Maximum capacitance change as a function of temperature; see Fig.3	$\pm 15\%$
Ageing	typical 1% per time decade

Note

1. Measured at 1 V, 1 kHz, using a four-gauge method.

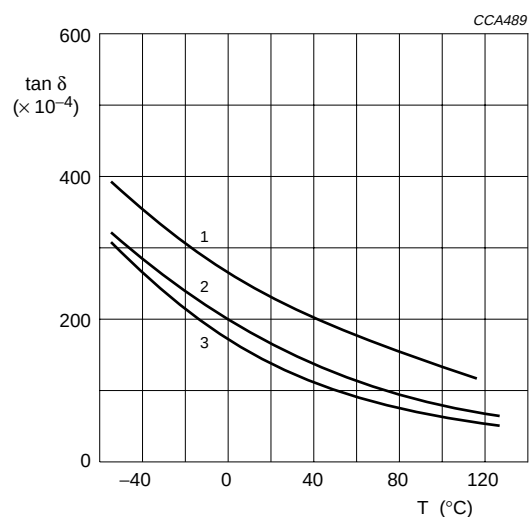
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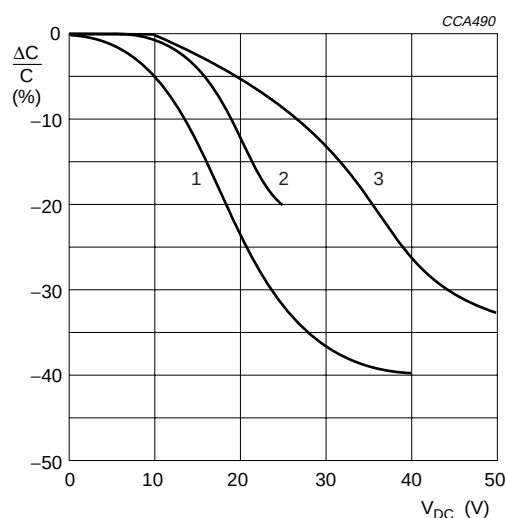
Curve 1 = 16 V product.
Curve 2 = 25 V and 50 V products.

Fig.3 Typical capacitance change as a function of temperature.



Curve 1 = 16 V product.
Curve 2 = 25 V product.
Curve 3 = 50 V product.

Fig.4 Typical tan δ as a function of temperature.



Curve 1 = 16 V product.
Curve 2 = 25 V product.
Curve 3 = 50 V product.

Fig.5 Typical capacitance change with respect to the capacitance at 1 V as a function of DC voltage at 20 °C.